Kuldeep Puorhit

kuldeeppurohit.github.io
kuldeeppurohit3@gmail.com | purohitk@msu.edu | +919884264834

Education

INDIAN INSTITUTE OF TECHNOLOGY MADRAS
MS+PhD | Department of Electrical Engineering
Image Processing and Computer Vision Lab
Research Advisor: Prof. A.N.Rajagopalan
2020 | Chennai, India
CGPA: 8.43

INDIAN INSTITUTE OF TECHNOLOGY MANDI
B.Tech | Department of Electrical Engineering
Grad. 2013 | H.P., India
School of Computing and Electrical Engineering

Skills

PROGRAMMING
Python • MATLAB • LaTeX
Familiar:
C/C++ • Lua

LIBRARIES
PyTorch • Tensorflow • Keras
Familiar:
Torch • MatConvNet • OpenCV

Service

BOOK REVIEWER
"Autonomous driving and driver assistance system", CRC Press 2020

JOURNAL REVIEWER
IEEE Transactions on Image Processing
IEEE Transactions on Multimedia
Computers and Graphics

CONFERENCE REVIEWER
CVPR 2021
AAAI 2021
NeurIPS 2021 (Sub-reviewer)
ICVGIP 2018
SPCOM 2018
NCVPRIPG 2017
ICAPR 2017

Teaching Assistant

Deep Learning for Imaging
Image Signal Processing
Introduction to Electrical Engineering

Experience

MICHIGAN STATE UNIVERSITY | Postdoctoral Research Associate
June 2020 – Present | Computer Science Department, MSU, MI, USA
- Research on designing efficient deep learning architectures for various computer vision tasks such as image restoration and scene segmentation.
- Advised by **Prof Vishnu Boddeti** in collaboration with Prof. **Prof Hayder Radha**.

CLOUDY SOFT | Remote Consultant (Deep Learning)
December 2020 – Present | Client: Fujitsu AI/ML lab, Japan
- Developing a automated data augmentation software for Deep Learning.
- Implementing fuzzy optimization of data augmentation to minimize training time while also improving computer vision model performance following **this paper**.

IMAGE PROCESSING AND COMPUTER VISION LAB, IIT MADRAS | Graduate Research and Teaching Assistant
2014 – May 2020 | IIT MADRAS, India
- Research on models to solve **computer vision** problems related to image restoration and scene understanding in presence of various degradations.
- Worked on sponsored project with NIOT, **Ministry of Earth Sciences**, Indian Govt.
- Assisted **Prof A N Rajagopalan** and **Prof Kaushik Mitra** in designing and conducting courses and programming labs at graduate and post-graduate level.

KLA-TENCOR | Research Intern
Dec 2016 - May 2017 | Chennai, India
- Addressed the blind reconstruction problem in scanning electron microscope (SEM) photometric stereo for complex semiconductor patterns to be measured.
- Developed an optimization framework using domain-specific priors on surface and sensor patterns for robust estimation of the 3D surface structures.
- Developed a visual quality enhancement scheme for improving noisy SEM images.

CENTER FOR ARTIFICIAL INTELLIGENCE AND ROBOTICS, DRDO | Research Intern
Dec 2011 – Jan 2012 | Bangalore, India
- Worked on UAV based vehicle detection and tracking for wide area surveillance.
- Implementation successfully verified and incorporated into DRDO's vision library.

Awards and achievements

2020	Travel grant	Awarded by **ACM** and **AAAI** for presenting a paper in AAAI, USA
2020	News Coverage	Work featured in QS-GEN Magazine (**Global ranking agency QS**)
2020	Invited Talk	Presented at Vision India Tracks of NCVPRIPG and ICVGIP.
2019	Travel grant	Awarded by **Google** for giving an oral presentation in CVPR, USA
2019	Runner-up	Bokeh Effect and image Super-resolution Challenges, **ICCV**
2019	Winner	Image Colorization Challenge, **CVPR**
2019	Finalist	Several Image Restoration **Challenges** in CVPR, ICCV and ECCV
2019	Travel grant	From IIT Madras to present my work at ICCV, Korea
2018	Best Paper Award	(Runner Up) at the Computer Vision Conference ICVGIP, India
2017	Finalist Team	The Annual Intelligent Ground Vehicle Competition (**IGVC**), USA
2017	13^{th}/4000	**Hackerearth** Deep Learning Challenge on Image Classification
2016	Top 0.3%	(National) Graduate Aptitude Test in Engineering (**GATE**)
2012	Scholarship	Awarded annually to **meritorious** under-graduates by IIT Mandi.
2010	Scholarship	From **Indian Government (MHRD)** for XII-class performance.
2009	Top 1%	(National) IIT- Joint Entrance Examination (**IIT-JEE**)
2009	23^{rd} rank /60000	(State-level) Rajasthan Pre-Engineering Test (RPET)

Coursework

POST-GRADUATE LEVEL

Deep Learning
Machine Learning for Computer Vision
Digital Video Processing
Image Signal Processing
Digital Signal Processing
Applied Linear Algebra
Probability Foundations
Fundamentals of Linear Optimization
Pattern Recognition

Additional Projects

Autonomous Bot

The Annual Intelligent Ground Vehicle Competition (IGVC), USA (2017)

- Our team (Team Abhiyaan, IIT Madras) designed a fully autonomous ground vehicle.
- Designed Computer Vision module for real-time lane detection and obstacle segmentation.

Vision based Sign Language Translation System

B.Tech Project, IIT Mandi (2012)

- Developed a learning based approach to perform hand-gesture recognition using a depth-aware camera (Kinect).
- Trained a Convolutional Neural Network on American Sign Language (ASL) Fingerspelling dataset to classify hand gestures.

Conferences attended

CVPR 2020, Online
AAAI 2020, New York, USA
ICCV 2019, Seoul, Korea
CVPR 2019, California, USA
ICIP 2016, Arizona, USA
ICVGIP 2016, IIT Guwahati
NCC 2016, IIT Madras
ICVGIP 2014, IISc Bangalore

References

Dr. Vishnu Boddeti
Professor, vishnu@msu.edu
Michigan State University

Dr. A N Rajagopalan
Professor, raju@ee.iitm.ac.in
Indian Institute of Technology Madras

Dr. Kaushik Mitra
Professor, kmitra@ee.iitm.ac.in
Indian Institute of Technology Madras

Publications (with links)

- "Spatially-Attentive Patch-Hierarchical Network for Adaptive Motion Deblurring", IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2020.
- "Region-Adaptive Dense Network for Efficient Motion Deblurring", AAAI Conference on Artificial Intelligence (**AAAI**), New York, USA, Feb 2020
- "Bringing Alive Blurred Moments", IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), Long Beach, CA, USA, June 2019. (**Oral**)
- "Degradation Aware Approach to Image Restoration Using Knowledge Distillation", IEEE Journal of Selected Topics in Signal Processing (**JSTSP**), 2020.
- "Depth-guided Dense Dynamic Filtering Network for Bokeh Effect Rendering", IEEE International Conference on Computer Vision (**ICCV Workshop**), 2019.
- "Mixed-Dense Connection Networks for Image and Video Super-Resolution", Elsevier **Neurocomputing**, October 2019.
- "Multi-level Weighted Enhancement for Underwater Image Dehazing", **Journal** of the Optical Society of America A (**JOSA-A**), June, 2019.
- "Efficient Motion Deblurring with Feature Transformation and Spatial Attention," IEEE International Conference on Image Processing (**ICIP**), 2019.
- "Scale-Recurrent Multi-residual Dense Network for Image Super-Resolution," In the Springer European Conference on Computer Vision **(ECCV Workshop)** on Perceptual Image Restoration and Manipulation, 2018.
- "Color Image Super Resolution in Real Noise," In ACM Indian Conference on Computer Vision, Graphics and Image Processing (**ICVGIP**), December 2018.
- "Learning based Blur Detection and Segmentation," In IEEE International Conference on Image Processing (**ICIP**),September 2018.
- "Mosaicing Deep Underwater Imagery," In ACM Indian Conference on Computer Vision, Graphics and Image Processing (**ICVGIP**), December 2016.
- "Splicing Localization in Motion Blurred 3D Scenes," In IEEE International Conference on Image Processing (**ICIP**), September 2016.

UNDER REVIEW

- "Spatially-Varying Image Restoration through Distortion-Guided Sparse Networks", submitted to **CVPR** 2021.
- "Distillation-guided Image Inpainting", submitted to **CVPR** 2021.
- "Degradation-aware Partial Processing for Single Image Raindrop Removal", submitted to **CVPR** 2021.
- "Aperture-Hierarchical Attentive Reconstruction Network for Light-Field Spatial and Angular Super-resolution", under review at IEEE Transactions on Computational Imaging (**TCI**).
- "Planar geometry and latent scene recovery from a single motion blurred image"., under review at **Machine Vision and Applications** Journal.

CO-AUTHORED WORKSHOP PROCEEDINGS

NTIRE 2020 Challenge on Image and Video Deblurring (CVPR)
AIM 2019 Challenge on Real-world Super-resolution: Methods and Results (ICCV)
AIM 2019 Challenge on Image Demoireing: Methods and Results (ICCV)
AIM 2019 Challenge on Bokeh Effect Synthesis: Methods and Results (ICCV)
NTIRE 2019 Challenge on Image Colorization: Report (CVPR)
NTIRE 2019 Challenge on Video Super-Resolution: Methods and Results (CVPR)
NTIRE 2019 Challenge on Video Deblurring: Methods and Results (CVPR)
NTIRE 2019 Image Dehazing Challenge Report (CVPR)

Extra-curricular

PG Coordinator | Training and Placement Cell | (2014 – 2015) | IIT MADRAS

- Facilitated the placements process and various professional training events.
- Explored industrial opportunities for post-graduate students and invited them.

Senior Member | Robotics Section | (2010 – 2011) | IIT MANDI, India
Hosted competitions and organized a hands-on workshop with Robotech Labs.